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TUMOR OF THE CEREBELLUM WITH REPORT OF CASES.[1]

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THE subject of tumor of the cerebellum is important on account of the relative frequency with which new growths occur in this locality, and also, because they can in many instances be localized with sufficient definiteness to warrant an attempt at removal. It has only been of recent years thought possible to localize growths of the cerebellum, and most modern writers pay rather scant attention to this subject. Even such an acute diagnostician as the late Hilton Fagge expresses his doubt as to whether localization of cerebellar tumor is not sometimes due to luck rather than skill. A careful review of the reported cases of the past half-dozen years will show how entirely possible it is to definitely localize new growths of the cerebellum. Of course, we know that, now and then, an autopsy reveals a large tumor of the cerebellum, which had apparently produced no symptoms during life, yet we cannot help feeling that if a more careful examination of the patient had been made symptoms would have been elicited which would have revealed the nature of the case. The relative frequency of tumor of the cerebellum is well shown in the collection of cases reported by Gowers. In 650 cases of intra-cranial new growth, 295 were in the cerebrum, and 179 in the cerebellum. If we consider the much smaller size of the cerebellum, it becomes obvious that it is more liable to new growths than the great brain. Tumor of the cerebellum may occur at any age, though, perhaps, it is more common in early adult life. Certain varieties, as we shall see, are peculiarly liable to occur in the first decade. As to the variety of tumors, we may have first, those dependent upon certain diathesis, as tuberculosis and syphilis. Tubercular growths are more frequent in the cerebellum than in other parts of the brain, and are met with especially in children.

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Hale White says, bearing in mind the autopsies at Guy's Hospital, "A cerebellar tumor in a child is almost certainly tubercular." Tubercle may invade the brain from the meninges, or may take its origin in the adventitia of the vessels. In the brain it forms a roundish mass known as *solitary tubercles*. In a large number of instances tubercular disease is present elsewhere in the body.

Syphilitic tumors occur not infrequently, and are seen after the acquired, and possibly in the hereditary form of the disease. The growth or gumma takes it origin from the meninges, but often extends into the substance of the brain, though its origin can usually be traced to the meninges. It is well to remember in regard to both tubercular and syphilitic growths, that they are often multiple.

Glioma is a very common form of tumor of the brain, met with more often in the cerebrum than in the cerebellum. It is made up of branched neuroglia cells and often closely resembles sarcoma. It may form a firm mass, or exist as a soft infiltration. Several varieties of this tumor are described as glio-myxoma, glio-sarcoma, etc. Sarcoma is frequently met with, the most common variety being the spindle cell.

Many other kinds of tumor are occasionally found in the cerebellum : carcinoma, parasitic cysts, fibroma, and others.

When we come to study the symptomatology of tumor of the cerebellum, we must first consider certain general symptoms common to all forms of intra-cranial growth independent of their locality. The symptom that is usually first observed by the patient, and for the relief of which advice is sought, is pain. The nature of the headache is sometimes a dull, boring pain, at others, a most intense agony. The noticeable feature is its constancy. There are exacerbations and remissions, but at all times more or less distress, rarely a moment of freedom from pain. When a patient complains of persistent pain in the head for months, tumor of the brain is always suggested. The pain is generally either frontal or occipital, sometimes general and not localized.

It is hard to say just how the pain is caused. In most instances it is caused by pressure directly or indirectly upon the meninges, sometimes by the general intra-cranial pressure. Moderate compression of brain substance would not seem to occasion pain. The value of the location of the pain is not very great in general, but seems to be worth more in determining tumor of the cerebellum than elsewhere. In a very considerable proportion of cases of tumor of the cerebellum, the pain is distinctly occipital and is often felt in the back of the neck. This is often due to direct pressure upon the tentorium. Tenderness on percussion, if carefully done, is of distinct value. If the skull is gone over with a percussion hammer, making light, regular taps, very often a certain area, corresponding roughly to the site of the tumor, shows marked sensitiveness. I have confirmed this fact in a number of instances, not only in tumor of the cerebellum, but in the case of tumors located elsewhere in the brain, especially if the growth be near the surface. Another symptom common to all intra-cranial growths is optic neuritis, which will be considered later in connection with affections of the cranial nerves generally, by cerebellar tumor.

Very early in the course of the disease is noticed the peculiar staggering, drunken gait: the characteristic cerebellar titubation. It differs very greatly from the highstepping gait of tabes, or the unsteadiness produced by paralysis of various sorts. It resembles the gait of a child learning to walk, or that of a person who first tries to walk after a prolonged and exhausting illness. There is a great uncertainty of movement, an impossibility to preserve the equilibrium. What the cause of this disturbance of locomotion is, has been a matter of some dispute. Hughlings Jackson attributes it to paresis of the spinal muscles. It would seem to be due in some cases, or at least to be exaggerated, by loss of muscular sense. From our studies in comparative anatomy we know that the cerebellum must be a very important factor in the regulation of bodily movements, and, as some observers think, presides over muscle tonus. We can, perhaps, better explain the peculiar gait of cerebellar disease by thinking of an impairment of those several functions of the cerebellum, with possibly some weakening of the spinal muscles. The motor disturbance is confined mainly to the lower extremities, the arms being rarely affected. Closing the eyes has very little if any tendency to increase the titubation. Rotary movements and movements of manège are not infrequently met with, though usually in rather slight degree, compared with such movements as are produced by operations on the cerebellum of the lower animals. Disturbance of equilibrium results, according to Nothnagle, only when the middle lobe is involved or compressed. While the conclusions of Ferrier and others in regard to the tendency of an animal to fall toward the side of the injury cannot be strictly applied to disease of the human cerebellum, still there is in this latter case a general tendency to conform to these conclusions. Particularly is this the case, I think, when the lesion involves the middle, and, perhaps, the other peduncles. If the lesion involve one lateral lobe, pressing on the middle lobe from that side and involving the peduncles, especially the middle peduncle, there is a most decided tendency to fall toward that side. It is doubtful if it makes any difference whether the pressure be exerted on the anterior or posterior part of the middle lobe, either causing the patient to fall forward or backward, but not distinctly to one side.

The older experimenters (Flourens and Renzi) claimed that destruction of the anterior part of the middle lobe caused the animal to fall forward, of the posterior portion, to fall backward. In one of the cases I report the tendency was almost invariably to fall backward. This was carefully and repeatedly tested, and the autopsy showed a tumor pressing upon the anterior portion of the vermis. In another case the patient would incline toward the left side and fall if not supported; the tumor in this case involving the left middle peduncle and slightly compressing the vermis on that side.

In some cases of cerebellar tumor muscular weakness is decided, but distinct hemiplegia is not common. Vomiting is by no means a constant symptom, and would seem to be due in some cases to the intense pain.

Sexual excitement, which the older writers attributed to disease of the cerebellum, is rarely, if ever, present in these cases.

The deep and superficial reflexes are, as a rule, unaltered, though there are many exceptions to this since we may have the motor tract involved. In a few cases the deep reflexes are lost, though there can be no very satisfactory explanation of this condition; more often the deviation from normal is towards exaggeration. Sensation is usually not affected, except in cases of pressure upon the cranial nerves. Of course, it is possible to have a hemianæsthesia, as we may have a hemiplegia, since a tumor may be so situated as to involve the sensory or motor tracts, but these cases are exceptions.

A symptom that has not been very often mentioned is loss of muscular sense. In one of my cases it was very marked, and distinctly, though to a less degree in the other two.

One of the most valuable symptoms of intra-cranial growth is optic neuritis. If optic neuritis be present along with some of the symptoms detailed above, the diagnosis of cerebellar tumor is reasonably certain. Tumors of considerable size may be present unaccompanied by this symptom, so that its negative value is not very great.

Space does not permit the discussion of the interesting question of how the growth produces the neuritis. It is important to bear in mind the fact that a very considerable degree of optic neuritis may exist without any very apparent interference with the vision, hence an ophthalmoscopic examination of the eyes is of great importance in any case of suspected intra-cranial growth. Moreover, in doubtful cases, it is important that the examination of the eyes be made by one skilled in the use of the ophthalmoscope. When the condition is well marked it is easy to recognize, but in early and slight cases it is often a difficult matter to say whether neuritis be present or not. While impressed with the great importance of this symptom, I would not be willing to go as far as Hale White does in the paper referred to, where he says, "we may conclude that optic neuritis is rarely, if ever, absent in intra-cranial growths."

Nystagmus is seen in tumor of the cerebellum, but is not a very constant symptom. The pupils show no constant alteration. Hearing is occasionally affected by pressure on the auditory nerve or its nucleus. Taste in the same way may be abolished. Other cranial nerves may be involved, of course, according to the situation of the tumor. One symptom that I have noticed particularly, is pressure upon the medulla, interfering with respiration and deglutition. I have seen this symptom in a very slight, hardly noticeable degree at first, gradually increase until death occurred. General convulsions have been noted, but are not very common. Rigidity, which may be slight, or may amount to tonic contraction of the muscles of the neck, often drawing the head back upon the shoulders, is a very common symptom of cerebellar tumor, and may be almost said to be characteristic. Slight mental disturbance is frequently seen, though many authors deny any impairment of the intellectual faculties.

In one of my cases there were furious maniacal outbursts. It is very important, as has been pointed out, to bear in mind the anatomy of the cerebellum and its relations with the rest of the brain, the medulla and the cranial nerves, since so many important structures may be pressed upon by a growth which is entirely within the cerebellum, but causes more or less displacement and consequent compression.

As illustrative of the symptomatology of cerebellar tumor, I give here three cases. The first has been reported before, the other two appear for the first time.

CASE I.—Male, aged 36; white; mechanic. General health always good; no syphilis. At one time had colica pictonum, but no neuritis followed. About eight months before admission into hospital he began to have pain in the back of his head and neck, and noticed some staggering in his gait. These symptoms gradually increased. When first seen his condition was as follows: Very marked mental hebetude, although he could answer questions in the main intelligently. Both sight and hearing were greatly impaired. Pupils moderately contracted, and reacted very sluggishly; slight nystagmus. There was no paralysis, and patient's muscular strength was remarkably good considering his long illness. General sensibility was unimpaired. Muscular sense was almost totally gone, both for arms and legs. The reflexes, superficial and deep, were rather diminished, though all present. Patient was unable to stand or walk without assistance. The moment support was withdrawn he fell backwards; no tendency to fall to either side. Complained of pain in occipital region and nape of neck, and there was decided tenderness on percussion over the occipital region. The diagnosis of tumor compressing middle lobe of the cerebellum was made, and as there were no symptoms of pressure upon the medulla, operation was advised, which patient's friends refused.

Death took place very suddenly and unexpectedly. Autopsy made twenty hours after death showed a tumor the size of a partridge egg, bi-lobed and of rather firm consistency, springing apparently from the posterior part of the corpus callosum and attached slightly to the falx and tentorium. The tumor pressed directly on the middle lobe of the cerebellum, riding it like a saddle, and flattening somewhat the corpora quadrigemina. Section of the hardened tumor showed under the microscope a certain number of very fine fibres running through the mass, with a few glia cells; there were many large round cells, small round cells and spindle cells, constituting what might be called a glio-sarcoma. Brain meninges and cord otherwise healthy.

CASE II.—Male; white; aged 25; farmer. Family and personal history good. Says he has suffered with severe headache since he was fourteen years old. When admitted into hospital he complained of most intense, agonizing headache, and marked stiffness of the neck. Would lie generally on his face with his head buried in the pillow. At times the paroxysms of pain were distressing to witness. Very unsteady on his legs, and would fall unless supported. No tendency to fall more to one side than the other. Stands as well with eyes closed as open. Strength little if at all impaired, and muscles well nourished. Reflexes somewhat increased, with slight ankle-clonus of left foot. Slight loss of muscular sense. Tenderness over occipital region on percussion. Paralysis of right internal rectus muscle, with slight weakness of left. No optic neuritis.

Patient was admitted on June 30 and became rapidly worse. Pain grew more intense and symptoms of pressure upon medulla appeared. Respiration became irregular and deglutition was difficult. Diagnosis of tumor of middle lobe, deeply situated and pressing upon the medulla, was made and operation advised against, as it was thought that it would not be possible to remove the growth. Patient died suddenly July 12. Autopsy showed a tumor about the size of a small hen's egg, attached apparently to the anterior medullary velum and superior peduncles, and growing deeply into the vermis. The tumor was of rather firm consistency and microscopic examination showed it to be a spindle-cell sarcoma. No other lesion.

CASE III.—Male; white; aged 52; farmer. Family and personal history good. About two years before admission into hospital he began to notice some difficulty in walking, and was wrongfully accused of being intoxicated. Six months ago lost sight, which had been gradually failing.

Has a marked drunken, staggering gait; cannot stand with his feet together unless supported. Tends always to fall to left, and when supported just enough to prevent falling walks toward the left. If he is started up the ward by himself, or slightly supported, he invariably brings up against the beds on the left side of the room. Complains of pain in the occipital region and there is marked tenderness on percussion over the left occipital region. There is stiffness of the neck, with tendency to drawing of the head backward. No loss of general sensibility, except of the cornea of one eye. Slight loss of muscular sense. Slight increase of patellar reflex; no ankle-clonus. No paralysis.

and no muscular atrophy. There is double optic atrophy from neuritis. Pupils stationary, except when effort at accommodation is made. Almost complete anæsthesia of left cornea. No paralysis of eye muscles. Four days after admission the patient became very maniacal; tried to jump from the window, tore up the bed clothes, and had to be forcibly restrained.

Had unsystematized delusions and hallucinations. Finally fell into a comatose condition, with low-muttering delirium, and toward the last interference with respiration and deglutition. The diagnosis was made of tumor pressing on left middle peduncle and left lobe, and left side of middle lobe, with slight compression of pons at point of emergence of fifth nerve. Operation was advised. Patient died eleven days after admission into hospital, and autopsy showed a tumor the size of a small hen's egg, pressing on the middle peduncle of the left side and left lobe, and pressing slightly on the pons, compressing somewhat but not destroying the fifth nerve. There was no other lesion. Microscopic examination of the tumor showed it to be a sarcoma.

The ophthalmoscopic examination of these last two cases were kindly made for me by Dr. H. Friedenwald, and the microscopic preparations by Dr. N. G. Keirle.

Several other cases have come under my observation in which the symptoms have been unmistakable, but as they have not been confirmed by autopsy they cannot be used. The three cases mentioned, however, illustrate quite well the symptomatology of cerebellar tumor, and confirm to a certain degree the position taken, that it is possible to localize tumors of the cerebellum with some degree of exactness.

In regard to the course and prognosis of tumor of the cerebellum, little need be said. The results in nearly all cases are progressively and rapidly fatal. Two years might be put as the average limit. One of my cases gave a history of intense pain in the back part of the head for ten years previous to death, and it is reasonable to suppose that in this case there was a very slowly-growing tumor. Osler reports a case lasting perhaps fourteen years, as that was the duration of the headache, and later other symptoms appeared. Often the apparent duration is only a few months.

Possibly a small number of syphilitic tumors are cured by treatment, but when we have an undoubted syphilitic growth, we often fail with antisyphilitic remedies. This being the only variety of tumor that even theoretically could be benefited by treatment, we should try vigorous antisyphilitic medication in every case in which there is even a lurking suspicion of syphilis. Experience has taught me that the best way to introduce mercury rapidly is by inunction. This I combine with or follow by heroic doses of iodide of potash. Autopsies have shown that we may occasionally have tumors situated in the lateral lobes of the cerebellum without producing any symptoms, and these tumors sometimes become encysted and probably exist for many years without doing any damage.

The most interesting question, practically, about cerebellar tumors, is whether it is possible to remove them surgically. The results of intra-cranial surgery, brilliant as the operations have been, have not realized the great expectations that were raised by this daring interference. And yet in the case of brain tumor, with the few exceptions noted, surgical interference is not simply the last resort, it is the only resort. The dangers of operations on the brain have been reduced to a minimum, and it is the duty of every physician to put the case plainly before his patient, and not waste precious time vainly exploiting the hopeless theory of absorption.

While a very considerable number of tumors have been successfully removed from the cerebrum, and a few from the cord, I have not been able to find an instance in which the operation has been successfully performed in tumor of the cerebellum. A few cases of operation have been reported with fatal results. Two cases are reported by Suckling. In the first case the operation was performed by Jordan Lloyd, in a girl aged twelve. The tumor was a soft, infiltrating glioma, and hence could not be removed. The second case, reported by the same author, was operated on by Bennett May. It was a boy, aged seven years, with a tumor in the substance of the left lobe of the cerebellum, about an inch beneath the cortex. The operator says of the operation, "actual procedure found extremely easy of accomplishment, and of no great severity."

He states his belief that the case would have resulted favorably had the operation been attempted earlier. The third case is by Victor Horsley. Male; aged eighteen; tumor of the right lobe of cerebellum; died nineteen hours after operation.

The incision through the scalp in most instances began at the occipital protuberance and was curved downward, terminating near the mastoid portion of the temporal bone.

The trephine openings were large and were directed to the supposed seat of the growth. One important point in these operations is to enlarge the opening made by the trephine sufficiently to allow the parts to be well examined.

In the cases I have reported, the first, I am sure, offered a very easy operation. The tumor was small and lightly attached. The second case was not a suitable one for operation. The third case presented greater difficulties for an operation than the first, but could, I think, have been removed if a sufficiently large opening had been made in the skull. The tumor was not very large and its attachments were not firm.

The conclusions to be drawn from these cases, and I think from the majority of the cases reported during the last half-dozen years, are, it seems to me, first, that tumors of the cerebellum can be localized with a reasonable exactness, and, second, that operation, offering as it does the sole chance for relief, should be oftener resorted to.